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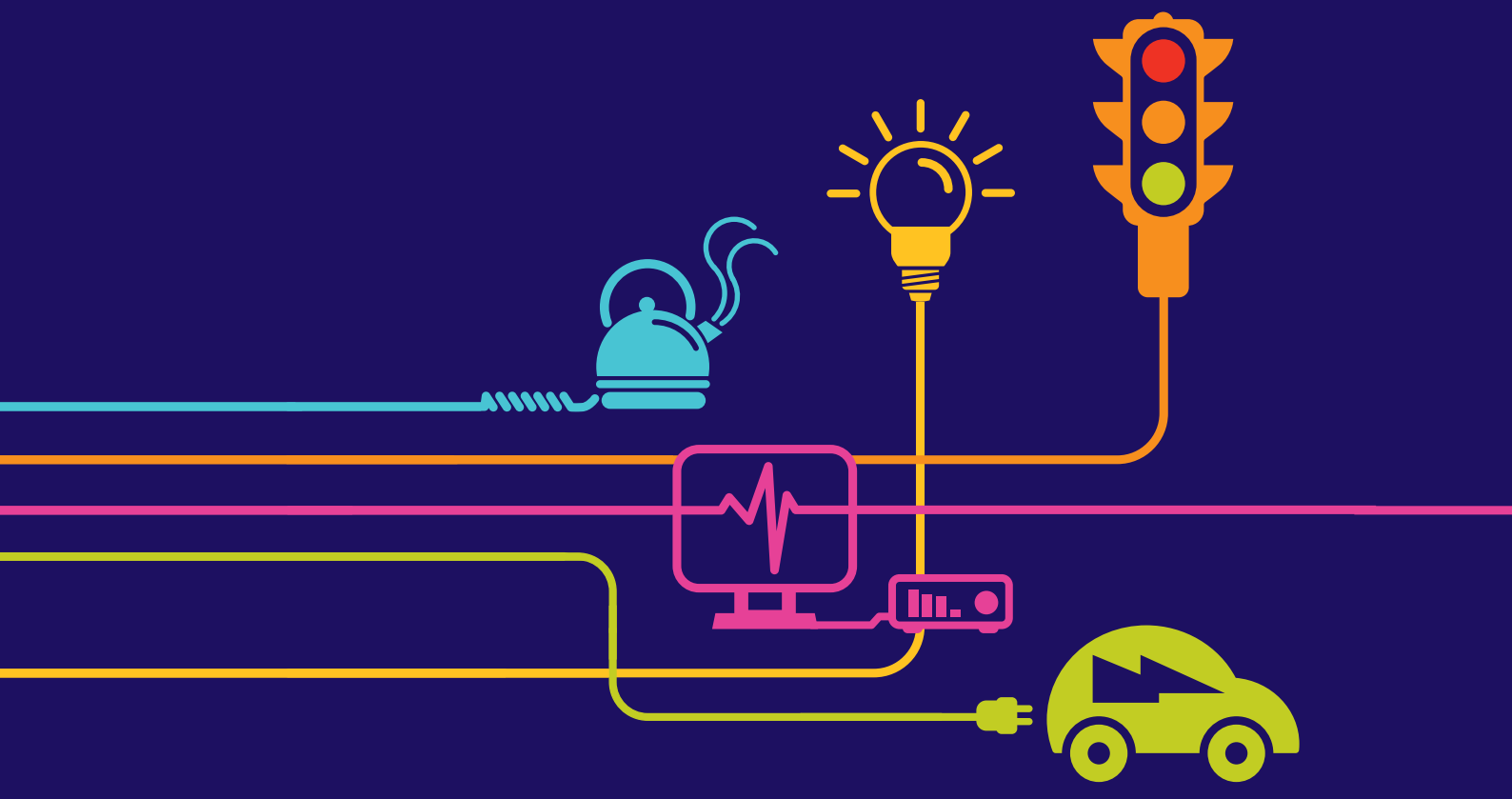
Document 5.29.2.3

Environmental Statement
Flood Risk Assessment Sensitivity Test

Hinkley Point C Connection Project

Regulation 5(2)(q) of the Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009



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Environmental Statement Sensitivity Test

Hinkley Point C Connection Project

5.29.2 – Environmental Statement Supporting Documents- Sensitivity Test

(orange highlight indicates the contents of this Volume)

Volume	Title
5.29.2.1	The Applicant's Report to Support Habitats Regulations Assessment Sensitivity Test
5.29.2.2.1	Transport Assessment Sensitivity Test
5.29.2.2.2	Transport Assessment Sensitivity Test Appendix A- Revised Construction Programme
5.29.2.2.2	Transport Assessment Sensitivity Test Appendix B Assessment Tables
5.29.2.2.2	Transport Assessment Sensitivity Test Appendix C Junction Profile Graphs
5.29.2.2.3	Transport Assessment Sensitivity Test Appendix D Revised Capacity Model Outputs
5.29.2.3	Flood Risk Assessment Sensitivity Test
5.29.2.4	Draft Construction Environmental Management Plan Sensitivity Test

Flood Risk Assessment Sensitivity Test

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Hinkley Point C Connection Project

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VOLUME 5.29.2.3 - FLOOD RISK ASSESSMENT SENSITIVITY TEST

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1 INTRODUCTION

1.1 Background

1.1.1 National Grid Electricity Transmission plc (National Grid) has submitted an application under the Planning Act 2008 to seek powers to construct, operate and maintain a new 400,000 volt (400kV) connection between Bridgwater, Somerset and Seabank Substation, north of Avonmouth, together with various associated development and other works ('the Proposed Development').

1.1.2 The application was submitted to the Planning Inspectorate (PINS) on the 28 May 2014. PINS confirmed that the application has been accepted for examination on 17 June 2014 (reference number. EN020001).

1.1.3 Under the terms of its transmission licence, National Grid is obliged to make an offer of connection in response to each valid application made. In September 2007, National Grid received an application from EdF Energy for the connection of a proposed new nuclear power station at Hinkley Point, Somerset (Hinkley Point C Power Station) to the high voltage electricity transmission system. This connection, as well as others in the South West and South Wales, triggered the need for new transmission capacity in the region.

1.1.4 That part of the Proposed Development that comprises an electric line above ground within section 16 of the Planning Act 2008 is a Nationally Significant Infrastructure Project (NSIP) for the purposes of that Act.

1.1.5 Under Section 31 of the Planning Act 2008, development consent is required for development to the extent that it is or forms part of an NSIP. Development consent is granted by the making of a Development Consent Order (DCO) for which application may be made under section 37 of the Planning Act 2008.

1.1.6 An Environmental Statement (ES) was submitted as part of the DCO application (the submitted ES). The submitted ES was prepared in accordance with the Planning Act 2008, The Infrastructure Planning (Environmental Impact Assessment) Regulations 2009 (SI 2009/2263) ('the 2009 Regulations') and The Infrastructure Planning (Applications: Prescribed Forms and Procedures) Regulations 2009. The submitted ES comprises **Volumes 5.1** to **5.27** of the DCO application submission.

1.2 Modifications to Connection Date

1.2.1 National Grid has received an application from EdF Energy for a modification to the connection date for the Hinkley Point C Power Station that seeks connection two years later than the present connection date described in the submitted DCO application.

1.2.2 As a result of the application from EdF Energy, on the 19 August 2014 a formal offer for a revised connection date was made by National Grid to EdF Energy.

1.2.3 EdF Energy has advised National Grid that, although technically this offer is confidential until signed, National Grid can inform PINS that an offer has been made.

1.2.4 To meet the revised connection date offered the construction programme, as presented and assessed in the submitted ES (**Volume 5.3.2**, **Appendix 3.B**), has also been revised.

1.2.5 The revisions to the construction programme are greater than moving the start of construction to a later date than presented in the submitted ES. The duration of the construction of the various individual proposed development components has changed; the duration of some development components have increased, others have decreased. The changes are described and explained in Chapter 3 of the sensitivity test (**Volume 5.29.1.1**).

1.3 Purpose of this Document

1.3.1 In light of the modifications to the connection date and the Revised Construction Programme, a review of the submitted Flood Risk Assessment (**Volume 5.23** of the submitted ES) produced to accompany the DCO application has been undertaken.

1.3.2 The purpose of this document is to provide a sensitivity test of the submitted Flood Risk Assessment (FRA) to consider whether there are changes to the assessment described in the submitted documents as a result of the Revised Construction Programme.

Submitted FRAs

1.3.3 The submitted FRA comprises a series of five separate FRAs related to the Proposed Development (**Volume 5.23.1** to **5.23.5** of the submitted ES) as follows:

- Bridgwater Tee Cable Sealing End Compounds Flood Risk Assessment (**Volume 5.23.1**);
- South of Mendip Hills Cable Sealing End Compound Flood Risk Assessment (**Volume 5.23.2**);
- Sandford Substation Flood Risk Assessment (**Volume 5.23.3**);
- Seabank Substation Flood Risk Assessment (**Volume 5.23.4**); and
- Hinkley Point C Connection Route Flood Risk Assessment (**Volume 5.23.5**).

1.3.4 The submitted Hinkley Point C Connection Route FRA (**Volume 5.23.5**) considered flood risk to all components of the route including substations and cable sealing end (CSE) compounds. Accordingly the submitted Hinkley Point C Connection Route FRA has been used as the basis to structure this FRA Sensitivity Test; the findings of the sensitivity test apply to all the submitted FRAs.

1.3.5 This FRA Sensitivity Test should be read in conjunction with the submitted FRAs (**Volume 5.23.1** to **5.23.5**) and the following other documents:

- Environmental Statement Chapter 10 – Hydrology and Water Resources (**Volume 5.10** of the submitted ES);
- Draft Construction Environmental Management Plan (**Volume 5.26** of the submitted ES); and
- Environmental Statement Sensitivity Test Chapter 10 – Hydrology and Water Resources (**Volume 5.29.1.1**).

1.4 Flood Risk Assessment Sensitivity Test Structure

1.4.1 As detailed above, this document follows the structure set out within the submitted Hinkley Point C Connection Route FRA which is as follows:

- **Section 2** provides an overview of any changes to the Proposed Development and the physical characteristics of the development area since the submission of the FRA.
- **Section 3** provides an overview of the flood hazards and risks to the route as a whole as a result of the Revised Construction Programme.
- **Section 4** describes the flood hazard and risks associated with all flood sources during operation as a result of the Revised Construction Programme.
- **Section 5** describes the flood hazard and risks associated with all flood sources including an assessment of estimated flood levels through the construction period as a result of the Revised Construction Programme.
- **Section 6** considers the impact of climate change as a result of the Revised Construction Programme.
- **Section 7** describes the flood risk management measures required as a result of the Revised Construction Programme.
- **Section 8** summarises the main conclusions from this FRA Sensitivity Test.

1.5 Figures and Appendices

1.5.1 None of the figures and appendices in the submitted FRAs (**Volumes 5.23.1** to **5.23.5**) change as a result of the Revised Construction Programme.

2 DEVELOPMENT DESCRIPTION AND POLICY CONTEXT

2.1 Introduction

2.1.1 This section provides a description of the site, the Revised Construction Programme, and the policy context.

2.2 Site Description

2.2.1 There have been no significant changes to the site description and landscape for each route Section (sections A to H) from that previously presented in the submitted FRA (**Volume 5.23.1** to **5.23.5**) that would require re-assessment as part of this sensitivity test

2.3 Project Description

2.3.1 This section describes the changes to the Proposed Development from that presented in the submitted FRA.

2.3.2 The only change to the Proposed Development is to the commencement and completion of the construction works and the construction duration of the various components parts of the development. All other aspects of the Proposed Development remain as described in Chapter 2 of the submitted FRA (**Volume 5.23.5**) and submitted ES (**Volume 5.3.1**).

2.4 Requirement for Changes in the Revised Construction Programme Duration

2.4.1 National Grid's transmission licence requires it to ensure the security of the supply of high voltage electricity. Part of National Grid's role involves balancing the supply of electricity between generators and users. This supply of electricity has to be delivered in combination with the need to allow for works on the National Grid transmission system (such as maintenance operations, carrying out repairs and making new connections).

2.4.2 To ensure the safety of those working on or near overhead power lines during works to the transmission system, the electricity flowing through the lines is usually turned off. These periods are known as "outages" and refer to when the normal power operation of the overhead lines is interrupted by some of the live electricity circuits being temporarily turned off, whilst at all times allowing sufficient power to continue to flow through other parts of the transmission system to maintain supply.

2.4.3 All outages have to be co-ordinated nationally and regionally within National Grid and with affected Distribution Network Operators (DNOs). The outages have to be "booked" several years in advance of need and normally can only occur during British Summer Time from March to October, when there is a lower power demand on the National Grid system.

2.4.4 To ensure that the Hinkley Point C connection project can be delivered by the proposed revised connection date, a Revised Construction Programme has been developed which is spread over a number of known and planned outage periods, having regard to the need to continue to provide high voltage electricity efficiently

and reliably whilst works progress and also the need to carry out work in a safe manner.

2.4.5 Accordingly, the revisions to the construction programme arising from a later connection date are greater than simply moving the start of construction to a later date than presented in the submitted ES. The Revised Construction Programme has to be planned to fit within the existing outages periods already scheduled by National Grid and the DNO (Western Power Distribution (WPD)). There are changes in the construction duration for a number of individual proposed development components (both increases and decreases in duration) and the length of the overall construction programme increases because of the different outages that would apply to the Revised Construction Programme.

2.5 Revised Construction Programme

2.5.1 To achieve the revised connection offer date, National Grid would start construction in December 2015, two months later than the Preliminary Construction Programme set out in the submitted ES (**Volume 5.3.1**, **Table 3.3** and **Volume 5.3.2, Appendix 3B**). Construction of the Proposed Development is anticipated to be complete by March 2022.

2.5.2 The duration of the total Revised Construction Programme is 76 months which is 25 months longer than the Preliminary Construction Programme detailed in the submitted ES.

2.5.3 As described above, this extension in duration is due to the need to connect the Hinkley Point C Power Station to the National Grid system within EdF's requested revised connection programme. This requires re-planning of the construction programme assessed in the submitted ES.

2.5.4 The construction methods described in Chapter 3 of the submitted ES and Section 2 of the submitted FRAs do not alter as a result of the Revised Construction Programme, with the exception of the 400kV Underground Cables through the Mendip Hills and at Sandford substation where works would be undertaken in a phased manner and restricted to a maximum working stretch of 3km. Further information is provided within the ES Sensitivity Test (**Volume 5.29.1.1**) and the Draft Construction Environmental Management Plan Sensitivity Test (**Volume 5.29.2.4**).

2.5.5 A summary of the Revised Construction Programme, compared to that assessed in the submitted ES and FRA, is set out below in **Table 2.1**.

Table 2.1 Revised Construction Programme

Proposed Development Component	Revised Start Date	Revised Finish Date	Duration of works in submitted ES (months)	Revised Duration of works (months)
400kV Overhead Line 400kV Route (South)	Q2 2018	Q2 2020	45 (total route)	27
400kV Overhead Line 400kv Route (North)	Q3 2018	Q3 2021	45 (total route)	39

Proposed Development Component	Revised Start Date	Revised Finish Date	Duration of works in submitted ES (months)	Revised Duration of works (months)
400kV Overhead Line 400kV Route (Huntspill to Bridgewater Tee)	Q3 2019	Q2 2020	45 (total route)	12
400kV Cable Mendip Hills Route- works between A38 Bristol Road to Tower head Road (including South of Mendip Hills CSE Compound, A38 Bristol Road (UGC) Compound and haul Road	Q1 2016	Q2 2020	48 (all works between Sandford Substation and A38)	54
400kV Cable Mendip Hills Route – works between Towerhead Road and Sandford Substation	Q1 2018	Q2 2020	48 (all works between Sandford Substation and A38)	30
400kV Cable – works between Towerhead Road and Sandford Substation (haul road and compound only)	Q1 2017	Q3 2021	48 (all works between Sandford Substation and A38)	45
Bridgwater Tee 400kV Cable Route	Q3 2019	Q3 2020	12	27
AT Route Underground and Overhead Line	Q4 2019	Q3 2020	12	12
W Route	Q2 2017	Q2 2019	24	27
BW Route Avonmouth Option A	Q4 2018	Q2 2019	21	9
BW Route Portishead Option B	Q4 2018	Q4 2019	21	15
G Route	Q3 2019	Q3 2020	13	15
Seabank Line Entries BW Route	December 2015	Q2 2016	30 (all Seabank Line Entries)	9
Seabank Line Entries G Route	Q1 2016	Q3 2016	30 (all Seabank Line Entries)	9
Seabank Line Entries DA Route	Q1 2018	Q3 2018	30 (all Seabank Line Entries)	9
N Route Overhead Line (including disconnection and removal)	Q3 2019	Q2 2020	9 (all N route works)	12
Hinkley Line Entries	Q3 2018	March 2022	36	45
Y Route Churchill	Q1 2018	Q4 2018	12	12
W Route Churchill	Q3 2018	Q3 2018	12	3

Proposed Development Component	Revised Start Date	Revised Finish Date	Duration of works in submitted ES (months)	Revised Duration of works (months)
Sandford 400/132kV Substation	Q1 2018	Q3 2020	24	33
Seabank 400/132kV Substation	Q4 2019	Q4 2021	24	24
Churchill 132/33kV WPD Substation	December 2015	Q4 2018	24	39 (works from Q4 2015 to Q1 2017 within substation boundary only)
Portishead 132/33kV WPD Substation	Q3 2018	Q2 2019	8	12
Avonmouth132/33kV WPD Substation	Q3 2019	Q2 2020	9	12
Removal of Southern Half F Route	Q3 2019	Q4 2019	12	6
Removal of Northern Half F Route	Q2 2020	Q2 2021	27	15
Removal of 132kV G Route	Q3 2019	Q3 2020	13	15

2.6 Policy Context

2.6.1 There are no changes or additions to the legislation, policy and guidance identified and discussed within the submitted FRA which are relevant to the Revised Construction Programme.

3 FLOOD HAZARD AND RISK

3.1.1 Flood hazard and risk have been assessed in accordance with the methods set out in section 3 of the submitted FRA (**Volume 5.23.5**).

3.1.2 There are no changes to the flood risk source or in the impact that each source has on the works as a result of the Revised Construction Programme.

3.1.3 **Table 3.1** identifies the submitted FRA to which this sensitivity test applies and the associated increase in construction programme length associated with the Revised Construction Programme.

Table 3.1 Submitted FRA- change in construction duration

Submitted Flood Risk Assessment	**Change in Construction Duration**
Hinkley Point C Connection Route (**Volume 5.23.5)**	+ 26 months
South of Mendips Hills CSE Compounds (**Volume 5.23.2)**	+ 6 months
Sandford Substation (**Volume 5.23.3)**	+ 9 months
Seabank Substation (**Volume 5.23.4)**	No change
Bridgwater Tee CSE Compounds (**Volume 5.23.1)**	+15 months

3.1.4 When considering flood risk associated with an increase in the length of the construction programme, both the likelihood of a flood event and the impact of an flood event need to be assessed. Accordingly, the sensitivity assessment has assessed the change in flood risk that the Revised Construction Programme is exposed to (i.e to determine the likelihood of a flood event) and also the impact of the construction phase on flood risk elsewhere that may be caused.

4 FLOOD HAZARD AND PROBABILITY – OPERATIONAL PHASE

4.1.1 The flood hazard and probability of the operational phase does change as a result of the Revised Construction Programme. Accordingly the operational phase is not considered in this sensitivity test.

5 FLOOD HAZARD AND PROBABILITY – CONSTRUCTION PHASE

5.1 Introduction

5.1.1 This section provides a sensitivity test of the construction phase FRA of the Proposed Development as a result of the Revised Construction Programme. The Hinkley C Connection Route FRA (**Volume 5.23.5**) assesses flood risk to all components of the development including CSE Compounds and Substations and refers to the entire route (Route Sections A to H). Therefore, in applying the sensitivity test to this FRA it covers all components of the construction phase.

5.2 Flood Probability

5.2.1 To be consistent, a comparable approach is sought for assessing the flood risk at the construction phase as undertaken for the operational life. The submitted FRA (**Volume 5.23.5**) assesses the impact of a 1 in 100 (1%) annual exceedance probability (AEP) fluvial flood event on the proposed development during its operational life. The probability of a 1% AEP flood event occurring during the 40 year operational life of the Proposed Development is 33%, increasing to 63% if the infrastructure is in place for 100 years (as per the orange cells in **Table 5.1**).

5.2.2 Taking a consistent approach to that adopted in the submitted FRA and to maintain a similar likelihood of occurrence when assessing the shorter construction phase of 5 years, it is appropriate to assess the impact of a 10% AEP flood.

5.2.3 This is demonstrated by the blue cells in **Table 5.1** which shows a 41% chance of a 10% AEP event occurring within a 5 year period, (i.e. a level of risk broadly similar (although higher) than the 1% AEP event during a 40 year period).

Table 5.1. Probability of a Design Event Occurring in a Defined Timeframe

Design Flood Event Annual Probability	Operational Life (or length of construction period) (years)						
	2	5	7	10	20	40	100
1 in 5 (20%)	0.36	0.67	0.79	0.89	0.99	1.00	1.00
1 in 10 (10%)	0.19	0.41	0.52	0.65	0.88	0.98	1.00
1 in 20 (5%)	0.10	0.23	0.30	0.40	0.64	0.87	0.99
1 in 25 (4%)	0.08	0.18	0.24	0.34	0.56	0.80	0.98
1 in 30 (3.3%)*	0.06	0.15	0.21	0.29	0.49	0.74	0.97
1 in 50 (2%)	0.04	0.10	0.13	0.18	0.33	0.55	0.87
1 in 100 (1%)	0.02	0.05	0.07	0.10	0.18	0.33	0.63
1 in 200 (0.5%)	0.01	0.02	0.03	0.05	0.10	0.18	0.39
1 in 500 (0.2%)	0.00	0.01	0.01	0.02	0.04	0.08	0.18

Notes: * Flood mapping for this event assessed for the Construction Phase

5.2.4 Information regarding the 10% AEP flood event and associated flood outline are not readily available, so the submitted FRAs took the more cautious approach of considering the impact of the larger 3.3% AEP (1 in 30) flood occurring during the 5 year construction phase. Flood mapping for this event is readily available on a consistent basis across the entire route. It is seen that there is a 15% chance of the 3.3% AEP flood event occurring during the 5 year construction phase (as per the pink cell in **Table 5.1**) which is a lower probability than the 1% AEP event occurring within a 40 year operational life.

5.2.5 The construction phase is extended to 76 months (assessed as 7 years in accordance with **Table 5.1**) as a result of the revised connection date offer. In light of this, there would be a slightly raised probability that a flood will occur during construction simply due to the increased duration of the construction works. Maintaining the same probability of occurrence as the 1% AEP flood over the operational life of the proposed development (assessed as 33%), the larger 5% AEP (1 in 20) flood event would need to be considered for comparison as this has a 30% chance of occurring over a 7 year period. This is shown in the green cells in **Table 5.1**.

5.2.6 As the 5% AEP (1 in 20) flood event is smaller than the 3.3% AEP (1 in 30) flood event that was assessed in the submitted FRA, there would be no change required to the assessment of flood risk as a result of the Revised Construction Programme. Whilst the probability of a flood occurring during the revised construction phase would increase due to the extended period of construction, the analysis adopted using the 3.3% (1 in 30) event is still a conservative approach and remains valid.

5.2.7 The values shown in **Table 5.1** indicate that even if the construction phase was extended to 10 years, there would only be a 29% chance of a 3.3% AEP (1 in 30) flood event occurring. This likelihood is still lower than that of a 1% AEP (1 in 100) event occurring in a 40 year period, indicated by the yellow cell in **Table 5.1**.

6 CLIMATE CHANGE

6.1.1 There would be no changes to the assessment of climate change impacts as presented in the submitted FRA as a result of the Revised Construction Programme.

7 FLOOD RISK MANAGEMENT MEASURES

7.1 Introduction

7.1.1 The conclusions from the assessment of the construction phase based on the Revised Construction Programme indicate that there is the potential for the construction phase works to be affected by flooding from various sources, and that without mitigation the works could increase flood risk elsewhere. This is the same conclusion as set out in the submitted FRA and the same mitigation applies.

7.2 Flood Event Mitigation

7.2.1 It has been shown that extending the period of time over which the construction takes place results in a slightly increased probability of a flood event occurring. However, there are no specific features of the flood event that would make the impact worse depending on when it occurred during the construction phase (i.e. in year 1, year 5 or year 7) as long as the mitigation measures proposed remain in place consistently throughout the revised construction period. There is no change in how flood risk may affect the proposed construction works from that already detailed in the submitted FRA.

7.2.2 At all proposed development sites, the submitted FRA specifies the mitigation measures required to prevent the works increasing flood risk elsewhere. In all cases, the mitigation measures are unchanged from those specified in the submitted FRA as a result of the Revised Construction Programme. However, the mitigation measures would need to be in place for longer to include the full duration of the revised construction phase. The details of how flood risk to, and caused by, the proposed development sites will be managed during the construction phase are detailed in the draft Construction Environment Management Plans (CEMP) (**Volume 5.26** of the submitted ES)**.**

8 CONCLUSIONS

8.1.1 The submitted FRA assesses flood risk for all components of the Hinkley C Connection Route including CSE Compounds and Substations. The submitted FRA takes a conservative approach by assessing a 3.3% AEP (1 in 30) flood event occurring during the 5 year construction phase.

8.1.2 The sensitivity test has shown that the Revised Construction Programme increases the likelihood of a flood event occurring as a result of the increased time exposed to the flood hazard. However, the increased likelihood of a flood occurring is small and so the assessment of the 3.3% AEP (1 in 30) event is still appropriate and remains conservative.

8.1.3 Whilst the likelihood of a flood event occurring would be slightly raised as a result of the Revised Construction Programme, the impact of the flood event is unchanged from that assessed for the 5 year construction phase in the submitted FRAs.

8.1.4 This sensitivity test concludes that the conservative approach adopted in the assessment of flood risk for a 5 year construction programme, is still conservative as a result of the construction programme being extended to 76 months (assessed as 7 years in accordance with **Table 5.1**). Therefore, the findings of the assessment of flood risk and the mitigation measures identified still apply.

8.1.5 In all cases, the mitigation measures remain unchanged as a result of the Revised Construction Programme but would remain in place for longer. Full details of the runoff management measures will be detailed in the CEMP in accordance with the submitted draft CEMP (**Volume 5.26** of the submitted ES).